The IPCC Fourth Assessment Working Group Reports: Key findings

WMO

UNEP

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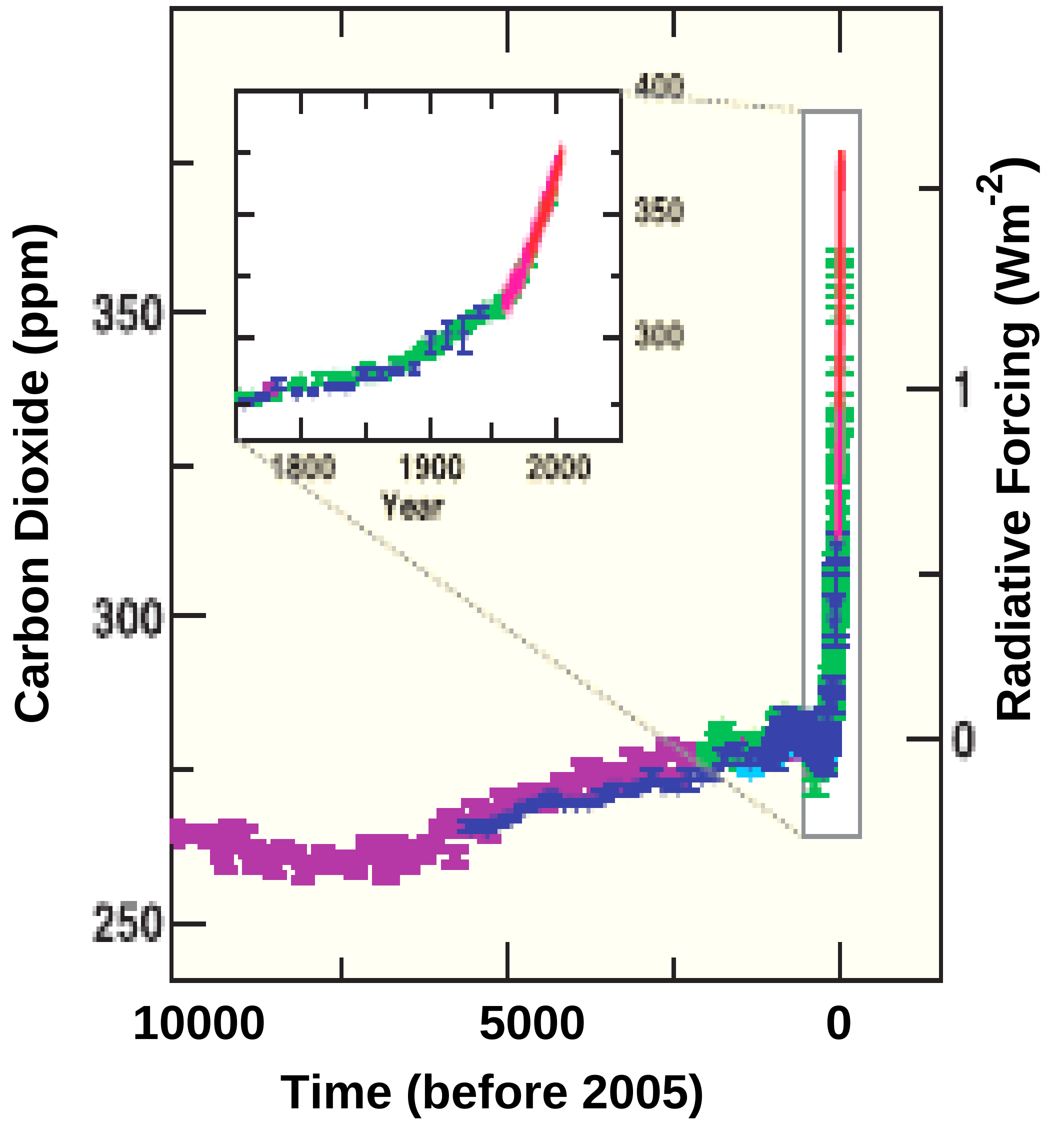
Human contribution to climate change

Global atmospheric concentrations of greenhouse gases **increased markedly as result of human activities**

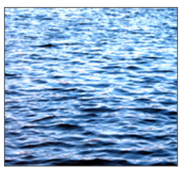
In 2005 concentration of CO_2 **exceeded by far the natural range** over the last 650,000 years

Changes in CO_2 from ice core and modern data



Direct observations of recent climate change

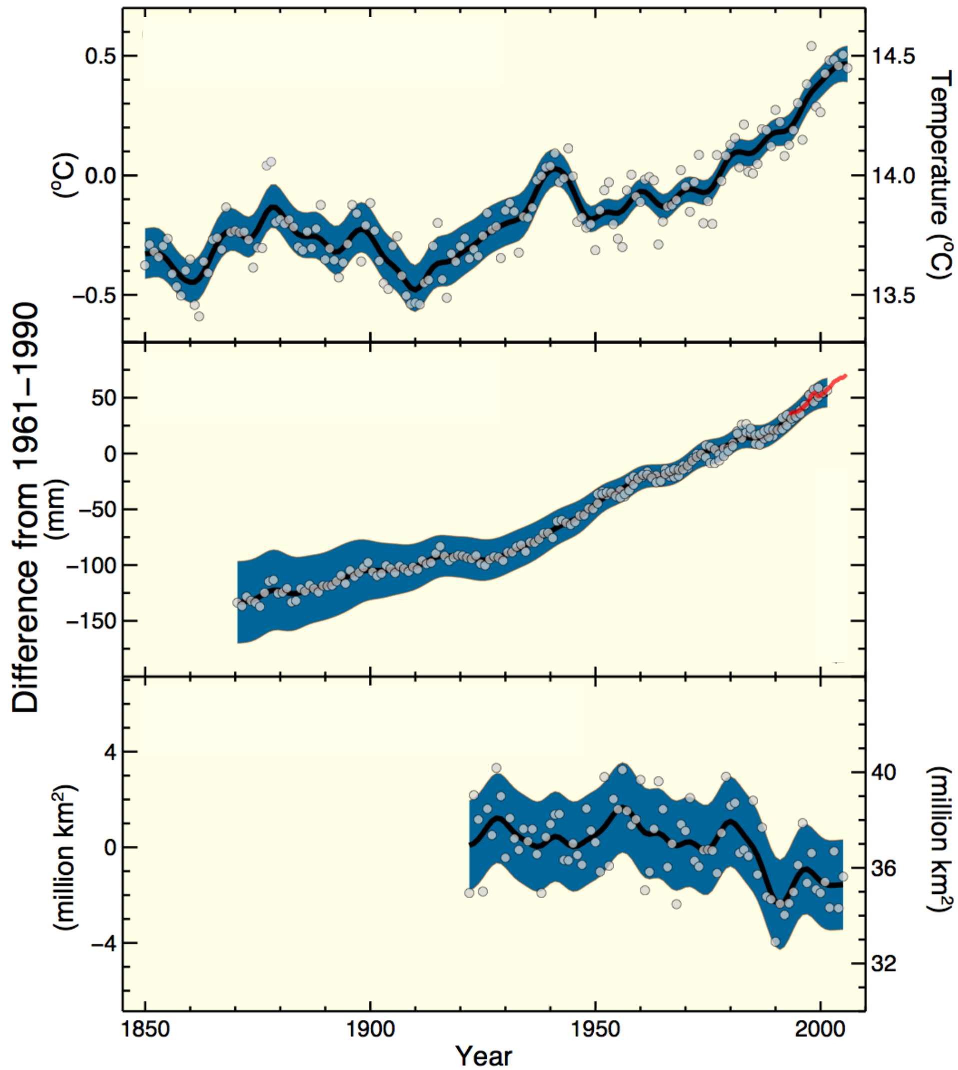
Global average temperature



Global average sea level

Northern hemisphere snow cover

Changes in temperature, sea level and northern hemisphere snow cover

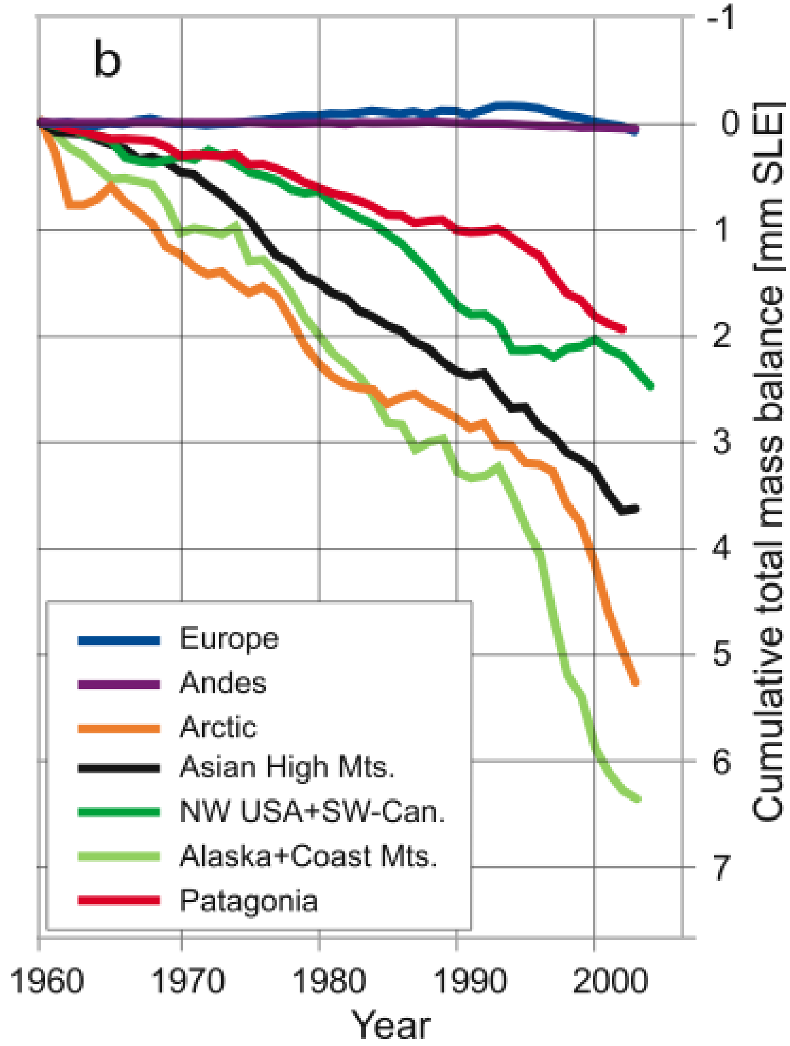


Glacier mass balance

During the 20th century, glaciers and ice caps have experienced **widespread mass losses** and have contributed to **sea level rise**

Further **decline of mountain glaciers** projected to **reduce water availability** in many regions

Cumulative balance of glacier mass in some regions



Heavier precipitation, more intense and longer droughts….

Key vulnerabilities to climate change

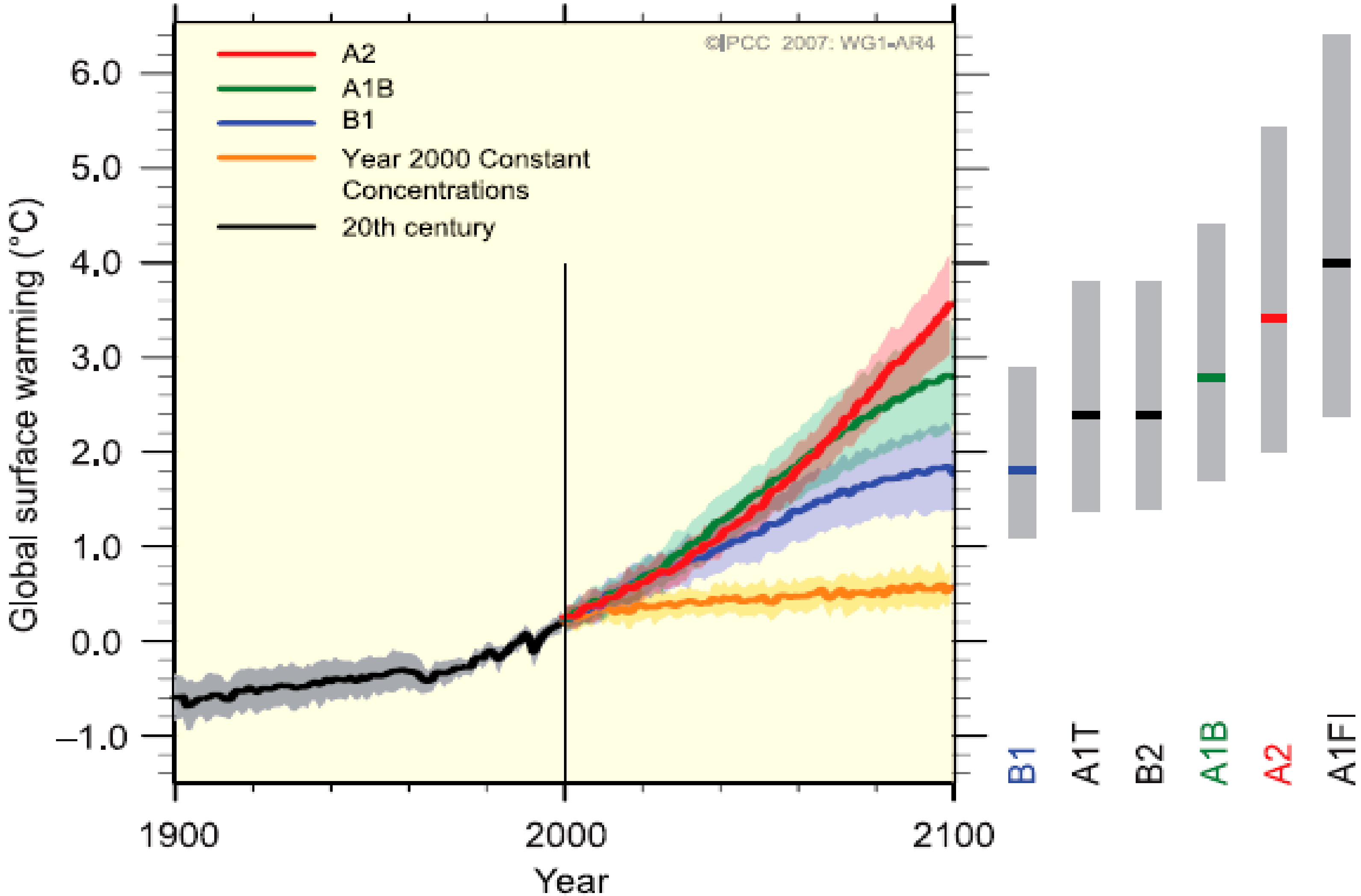
- **Some regions** will be more affected than others:
  - The Arctic (ice sheet loss, ecosystem changes)
  - Sub-Saharan Africa (water stress, reduced crops)
  - Small islands (coastal erosion, inundation)
  - Asian mega-deltas (flooding from sea and rivers)

- **Some ecosystems** are highly vulnerable:
  - Coral reefs, marine shell organisms
  - Tundra, boreal forests, mountain and Mediterranean regions
  - 20-30% of plant and animal species at risk of extinction

Coastal settlements most at risk

Ranges for predicted surface warming

Multi-model averages and assessed ranges for surface warming



Mitigation urgently needed

- Continued GHG emissions at or above current rate would induce **larger climatic changes** than those observed in 20th century

- Emissions of the greenhouse gases covered by the Kyoto Protocol **increased by about 70%** from 1970–2004

Mitigation needs to start in short term, even when benefits may only arise in a few decades

Beyond adaptation

- **Adaptation to climate change is necessary** to address impacts resulting from the warming which is already unavoidable due to past emissions
- However:
  - Adaptation alone cannot cope with all the projected impacts of climate change
  - The costs of adaptation and impacts will increase as global temperatures increase

Making development more sustainable can enhance both mitigative and adaptive capacity, and reduce emissions and vulnerability to climate change

Pathways towards stabilization

Characteristics of stabilization scenarios

Stabilization level (ppm CO_2-eq)	Global mean temp. increase at equilibrium (ºC)	Year CO_2 needs to peak	Year CO_2 emissions back at 2000 level	Reduction in 2050 CO_2 emissions compared to 2000
445 – 490	2.0 – 2.4	2000 - 2015	2000- 2030	-85 to -50
490 – 535	2.4 – 2.8	2000 - 2020	2000- 2040	-60 to -30
535 – 590	2.8 – 3.2	2010 - 2030	2020- 2060	-30 to +5
590 – 710	3.2 – 4.0	2020 - 2060	2050- 2100	+10 to +60
710 – 855	4.0 – 4.9	2050 - 2080		+25 to +85
855 – 1130	4.9 – 6.1	2060 - 2090		+90 to +140

◈ Mitigation efforts over the next two to three decades will have a large impact on opportunities to achieve lower stabilization levels

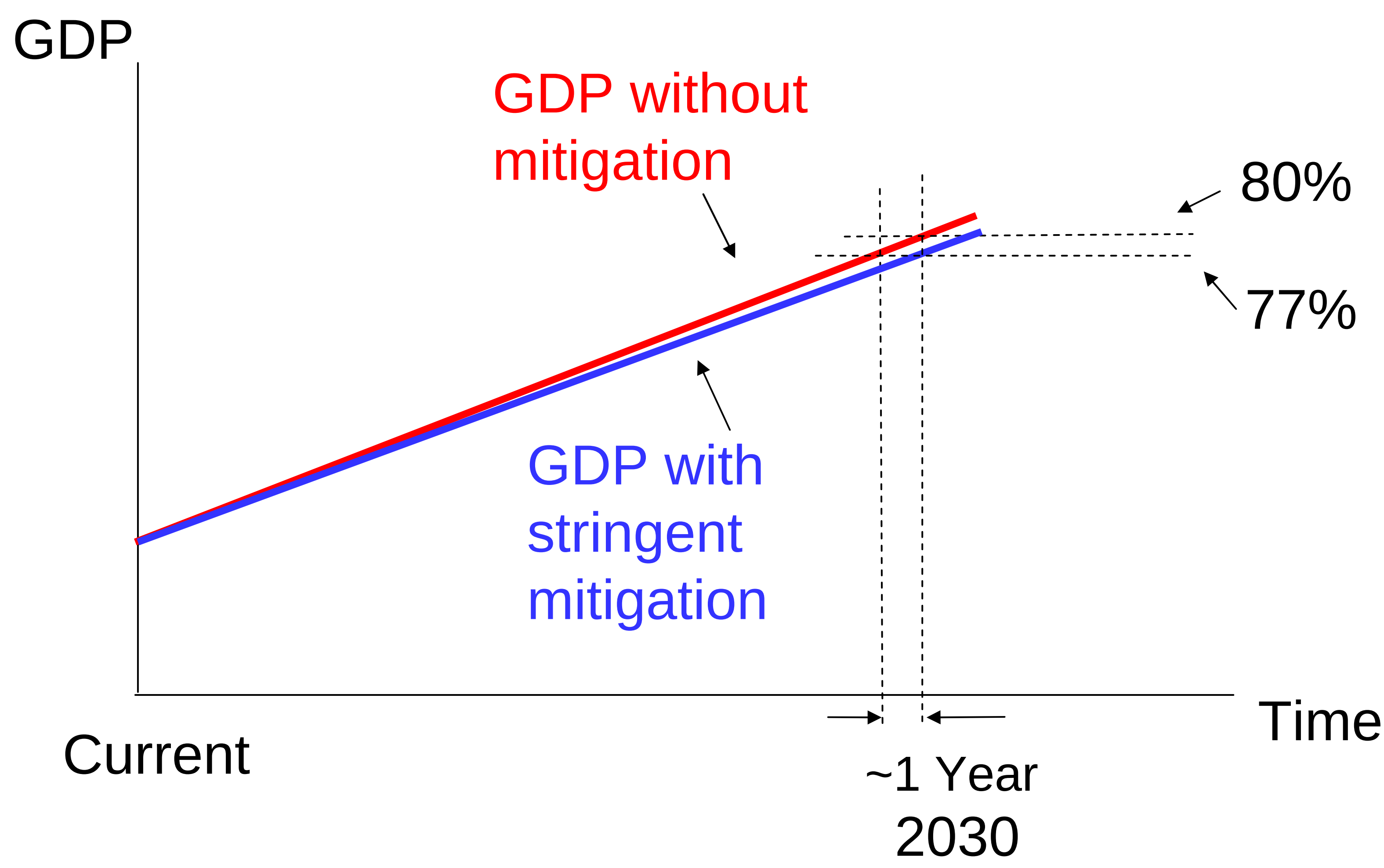
Mitigation costs in 2030

Estimated global macro-economic costs in 2030 for least-cost trajectories towards different long-term stabilization levels

Trajectories towards stabilization levels (ppm CO_2-eq)	Median GDP reduction (%)	Range of GDP reduction (%)	Reduction of average annual GDP growth rates (percentage points)
590-710	0.2	-0.6 – 1.2	< 0.06
535-590	0.6	0.2 – 2.5	<0.1
445-535	Not available	< 3	< 0.12

0.6% gain to 3% decrease of GDP

Illustration of cost numbers



Key technologies to reduce emissions

Key mitigation technologies and practices currently commercially available

Energy Supply

Efficiency; fuel switching; renewable (hydropower, solar, wind, geothermal and bioenergy); combined heat and power; nuclear power; early applications of CO2 capture and storage

Transport

More fuel efficient vehicles; hybrid vehicles; biofuels; modal shifts from road transport to rail and public transport systems; cycling, walking; land-use planning

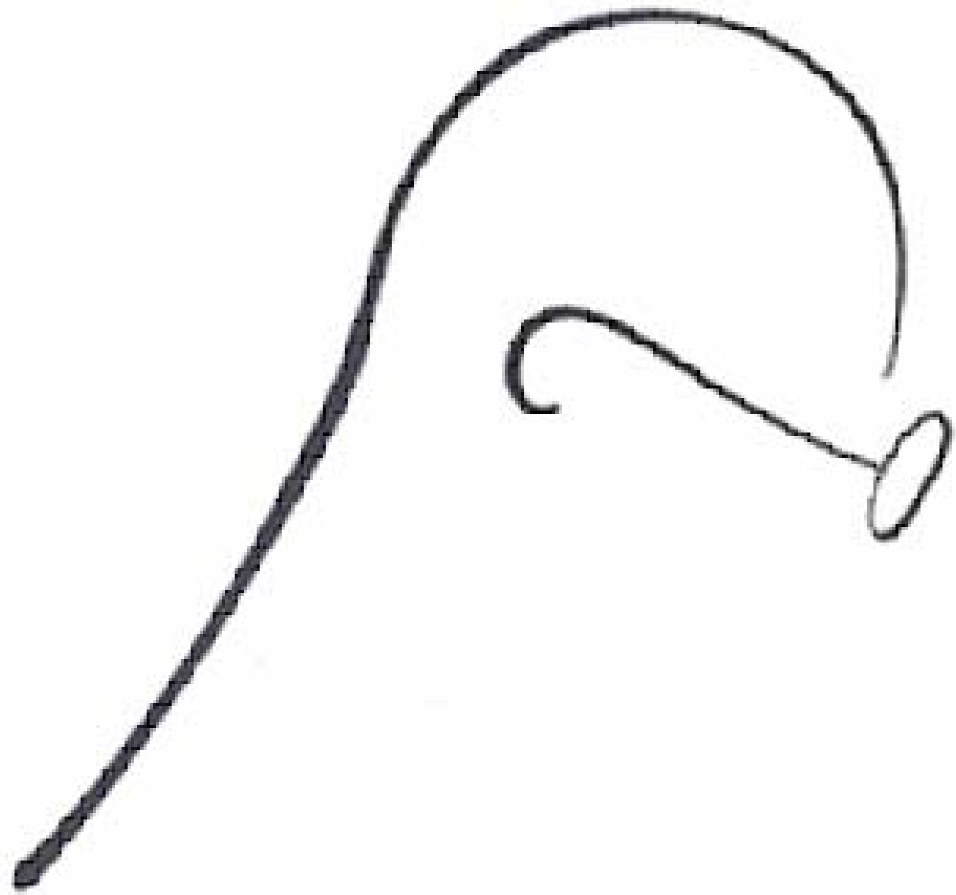
Buildings

Efficient lighting; efficient appliances and aircodition; improved insulation ; solar heating and cooling; alternatives for fluorinated gases in insulation and appliances

Key policies to reduce emissions

- Appropriate incentives for **development of technologies**
- Effective **carbon price** signal to create incentives to invest in low-GHG products, technologies and processes
- Appropriate **energy infrastructure** investment decisions, which have long term effects on emissions
- Changes in **lifestyle and behavior** patterns, especially in building, transport and industrial sectors



A technological society has two choices. First it can wait until catastrophic failures expose systemic deficiencies, distortion and self-deceptions…

Secondly, a culture can provide social checks and balances to correct for systemic distortion prior to catastrophic failures.